

ZOOGOER



Reptile
House
Guide

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ZooGoer (ISSN 06313-416X) is published six times a year by Friends of the National Zoo, National Zoological Park, Washington, D.C. 20008. Third class mailing permit no. 44282.

Subscription as percentage of full membership dues is \$4.00 a year. Subscription-only membership is \$5.00 a year and is available only to institutions and to those residing outside the Washington, D.C., area.

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Special Issue: Reptile House Guide

Volume 12, Number 2
March-April 1983

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Front Cover

The common iguana is native to forests from Mexico to Brazil. In the Zoo, they eat fruit, mice and vegetables. One tail vertebra has a fracture plane that breaks under pressure, so the iguana can escape if caught. The tail grows again, but the scales in the regenerated part are smaller and less colorful. (Photo by Jessie Cohen, NZP Office of Graphics and Exhibits.)

Something Old, Something New



Jessie Cohen, NZP Office of Graphics and Exhibits

The National Zoo's Reptile House opened in 1931. With its Romanesque design, the building won a national award as the outstanding brick building in the eastern U.S. On the left are new exhibit buildings and yards for crocodiles.

Dr. Dale L. Marcellini

More than 50 years ago, two American zoos decided to construct buildings just for exhibiting reptiles and amphibians, two "firsts of their kind" in the country. One was at the St. Louis Zoo and the other at the National Zoo. The impressive structure erected here still serves as the Reptile House.

The early planners and builders produced a remarkable building in both style and function. The elaborate sculptured columns, the bas-reliefs and mosaics are striking and unique. With the look of an ancient castle, the exterior contrasts with the more conventional and quite practical interior, a spacious hall bordered by skylit exhibits.

The exhibits are large by the stan-

dards for zoos in the 1930s and incredibly so by modern standards (many zoos have moved toward smaller exhibits, trying to have more species on display while fighting rising building costs).

Behind the scenes, the work space and animal holding areas are equally spacious and practical. The 31,000 square feet of floor space for animal housing, on three floors, would be

prohibitively expensive at today's construction costs.

During its 50 years, the Reptile House has been a big attraction for Zoo visitors. However, the high volume of traffic over many years took its toll, and the building gradually deteriorated. Roof leaks, an over-loaded electrical system, old and leaking plumbing and an increasingly inadequate heating system dictated that the building be renovated if it was to maintain its usefulness and appeal. It was closed in 1980 for nearly two years of renovation.

The improved appearance of the building is dramatic, but the renovation has also substantially increased the Zoo's effectiveness in recreation, education, conservation and research.

The public area has had a facelift, with new tile flooring, formica ledges and columns and a color scheme of subtle earth tones. One-way traffic through the building is encouraged by a new entrance and some interior changes.

Most of the exhibit enclosures were renovated while a few were completely rebuilt, such as the huge eye-level aquatic tank which gives visitors an underwater view of the *Yacare caimans*.

All the exhibits were redesigned by the herpetology staff to be attractive showcases for the animals. The colors enhance the animals' own colors, and plants grow in most enclosures.

Murals have been added, and there is even a stained glass window to help call attention to the enclosure holding the ashy gecko, one of the world's smallest reptiles. The animal identification signs are helpful but unobtrusive.

Grasses including bamboos and composites are among the many

species of plantings that surround the building and enhance the outdoor crocodile and tortoise exhibits. Designed by the Zoo horticulturist and the herpetology staff, the landscaping gives maximum effect with minimum maintenance.

When it was time to move the animals out of the Reptile House for



*The Reptile House has large aquatic exhibits that allow "above and below" viewing of animals like *Yacare caimans*, native to South America.*

Eric Noah



FONZ photo

The Reptile House entrance is framed by frogs and pterodactyls (prehistoric reptiles) sculpted by artist John Joseph Early; the mosaic over the door was designed by Charles R. Knight. The two 25-foot door columns stand on turtles carved from Tennessee marble.

the renovation, we took the opportunity to appraise the collection critically: Which species should we keep and which new ones should we add?

The result of this appraisal is a collection with excellent taxonomic balance. That means you don't see just snakes or even all the snakes in one family. It means you see representatives of all the major groups of reptiles and amphibians.

Some 100 species of reptiles and amphibians are housed, with more than 500 animals. The ratio of five individuals per species is one of the highest among major reptile houses in the United States. And nearly every species represented is on public view; many reptile houses hold species that are never seen by the public.

More functional space and new mechanical systems allow us to maintain breeding groups of many species and to raise hard-to-breed animals such as the emerald tree boa (see keeper Trooper Walsh's story elsewhere in this issue), Brazilian rainbow boas, basiliscus lizards, day geckos, redfooted tortoises and firebellied toads. The new crocodile buildings behind the main Reptile House should also encourage breeding.

For research, the renovations allow us to set up and run experiments that most reptile houses would find impossible. For example, we had the space to accept a group of 15 geckos offered to us, and we were

able to make careful observations of their individual behavior and interactions.

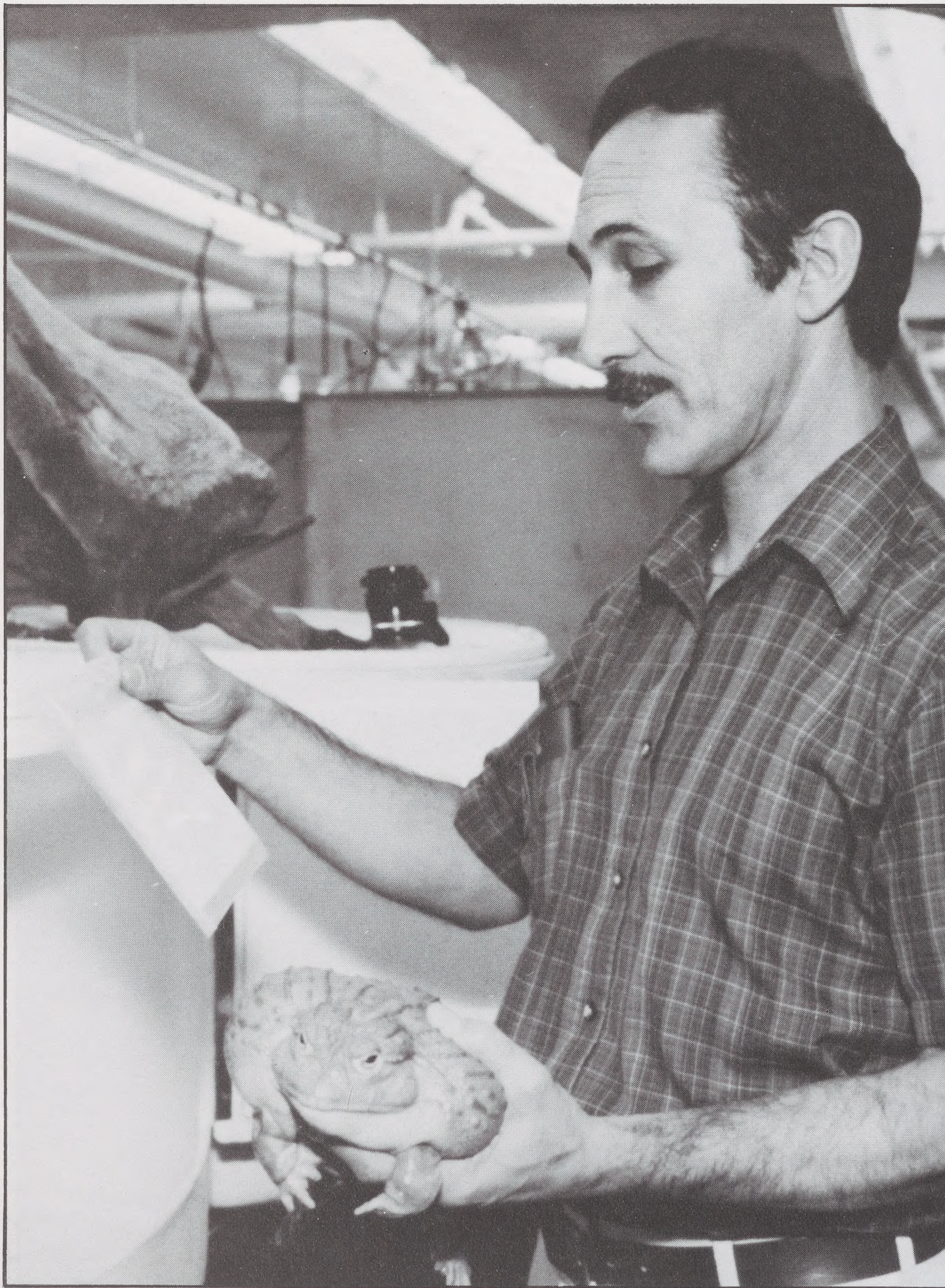
The program that the renovation has enhanced the most is education. Handsomely decorated cages and informative signs encourage the visitor to spend more time looking and learning. The new demonstration exhibit area lets us show the public such things as incubating eggs, newly hatched animals and ongoing experiments.

HERPlab, described by the Zoo's chief of education elsewhere in this issue, is perhaps the most exciting result of the renovation. This center for learning activities in the middle of the building is unique in zoos and allows visitors to experience reptiles and amphibians in a way that has never before been possible for the general public.

Clearly, the renovation of the Reptile House has succeeded in improving a fine old structure to better serve visitors, other zoos and the scientific community.

And it has increased the public's appreciation for the "herps," often misunderstood but fascinating animals. As one young visitor wrote, "My two favorite animals in the Zoo are the pandas and the leopard geckos." Out of the mouths of babes!

Dr. Marcellini is Curator, Department of Herpetology, and Acting Assistant Director for Animal Programs, National Zoological Park.



Herpetology curator Marcellini checks the record for an African bullfrog. Each animal has an identification number and a complete file of its history at the Zoo, along with a cage card for noting egg-laying and other activities.

Jessie Cohen, NHP Office of Graphics and Exhibits

Of Turtles and Toads

How do you tell the difference between a frog and a toad? A turtle, a tortoise and a terrapin?

These are not scientific divisions but only common names, and the definitions can change with the part of the country you're in. And even though you can name general characteristics for each group, there are plenty of exceptions.

The first step is to know the difference between reptiles and amphibians—these are two different taxonomic classes.

Reptiles include crocodilians, turtles, snakes and lizards. Frogs and salamanders are amphibians.

Amphibians lay their eggs in water or in wet places, and the young of most species go through a free-living larval stage in the water. Amphibian skin has many glands and loses water easily, which is why amphibians live in water or where humidity is high.

Reptiles have scales and fewer skin glands. Generally, they lose water less readily and can live completely on land, although many live in the water. Scales are tougher for land travel, too. Eggs are always laid on land (except by species in which young are born live), and there is no larval stage.

Reptile species that live in cooler climates tend to have live births because it's harder to find a warm place to lay eggs.

When is a turtle a terrapin? Terrapin generally means aquatic turtle but applies to different specific turtles in different parts of the country. Turtles are semi-aquatic or aquatic and have webbed feet designed for swimming. Tortoises are land-dwellers with stocky legs and round, flat feet. They usually have higher-domed shells than turtles, although the pancake tortoise is a notable exception.

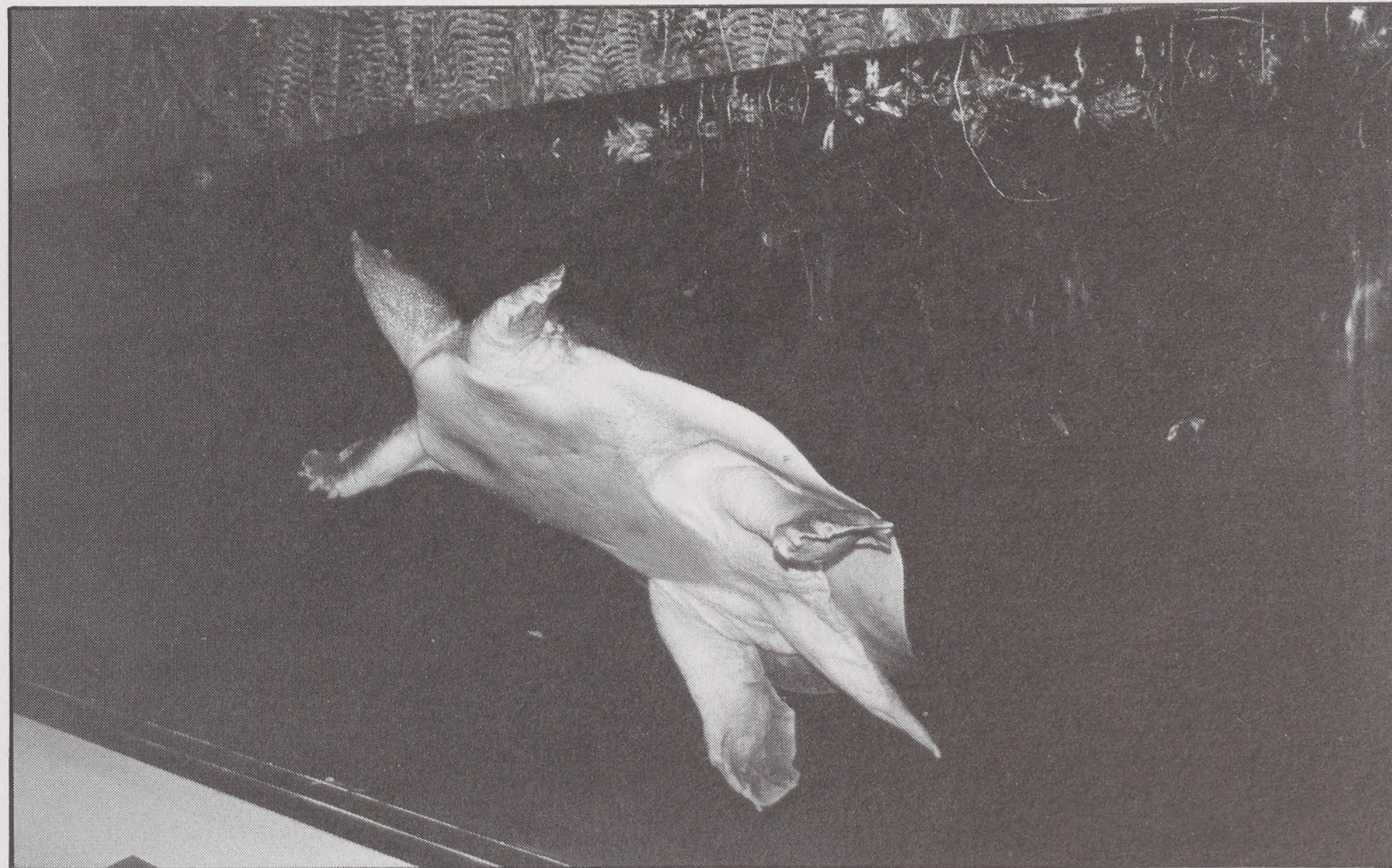
What about frogs and toads? Although there are plenty of exceptions, frogs are primarily aquatic animals with smooth skin and long hind legs which give them their well-known jumping power.

Toads are primarily land dwellers

except when they breed. They have bulkier bodies and shorter legs and bumpy skin blamed by legend for giving people warts. Toads are not guilty of that, but many of them do secrete poisons when they're bothered. The poison can cause eye irritation or other allergic-like reaction.

Crocodiles and alligators? Crocodiles are generally characterized by their lower teeth which you can see even when their mouths are closed. Alligators generally have much broader, less pointy noses than crocs.

You'd think you could at least tell the difference between a snake and a lizard without any question, but the National Zoo has two species of legless lizards!



This soft-shelled turtle has been at the National Zoo since 1937, making him the oldest Zoo animal. He was captured in the East Indies during a National Geographic-Smithsonian expedition.

Jessie Cohen, NHP Office of Graphics and Exhibits

Your Reptile House Visit

Michael Davenport

"Gee, they don't do much, do they?"

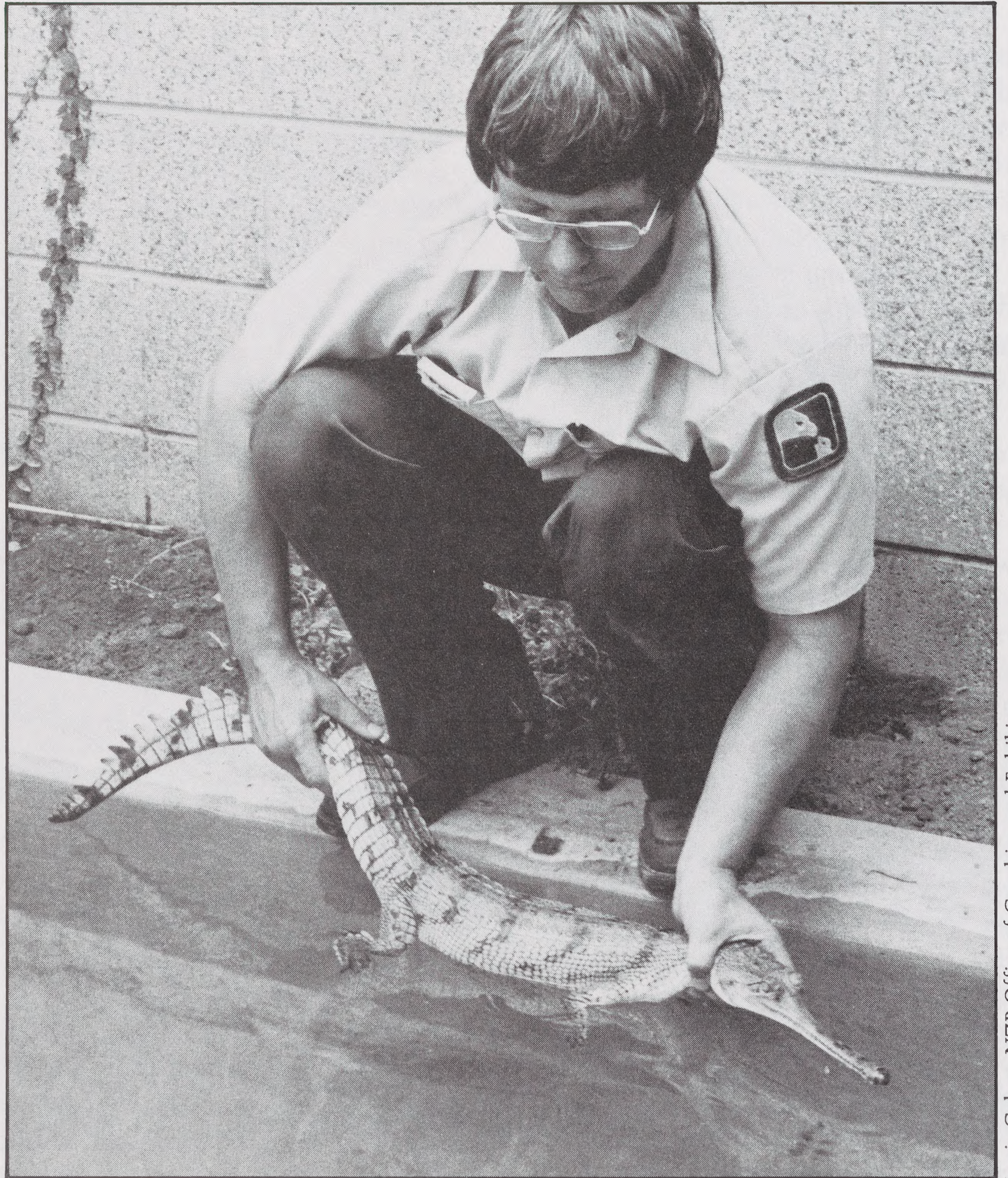
It's a remark visitors frequently make as they walk through the Reptile House. It's not surprising. Reptiles and amphibians are often found lying motionless in their exhibits. An occasional twitch of the leg or shake of the head may be the only thing to convince skeptical visitors that the animals are not made of plastic after all.

But with a little bit of planning and care, a visit to the Reptile House can be rewarding and fun.

In the summer, try to avoid the afternoon crowds by coming when the building opens (10 a.m.). During winter months and periods of poor weather, you can often have the building all to yourself.

If you are interested in seeing animal activity, walk through the building several times. Note the positions of the animals during your first trip and then look for changes during your second and third. You may be surprised at how much activity there is.

Never hesitate to ask questions of the keepers. You can find out when particular animals are fed, what new ones have been added to our collection and which have been courting,



One of the Zoo's gavials, rare animals that were a gift from the King of Nepal, is situated in its new home by keeper leader Mike Davenport.

Jessie Cohen, NZP Office of Graphics and Exhibits

mating and egg-laying. Keepers can also help you interpret what you observe and point out activity you might not have seen before.

Some of the kinds of activity you can see at the Reptile House are feeding, breeding, defense, aggressive behavior and thermoregulation as well as the husbandry techniques practiced by the keeper staff. If you come often during the year, you'll see all these over the course of your visits. (For feeding information, see Bob Davis' article elsewhere in this issue.)

Breeding takes place all year long. The red-footed and leopard tortoises seem to engage in breeding more frequently than other species. You often find them slowly and methodically digging egg cavities with their hind feet. Female basilisk lizards and water dragons dig egg cavities several inches deep, using their forefeet at a vigorous pace.

During the summer, painted turtles in the outdoor pond in front of the Reptile House can be seen in courtship. The male uses the long nails of his forefeet to titillate the female.

When you pass an enclosure that doesn't appear to have anything in it, remember that many reptiles and amphibians rely on camouflage for defense. Spend some time looking for the copperhead, as its color and pattern blend so well with the leaves on which it lives. The mata mata turtle and Surinam toad also blend into their environments.



Oriental fire-bellied toads are bright green with black markings, and adults have a red belly. Look for them on the rocks and plantings or in the small pool in their enclosure.

In contrast, the arrow poison frog uses its bright colors to advertise its poisonous nature to potential predators.

Antagonistic encounters are very apparent in some of the reptiles. There is no mistaking what is happening when one crocodile bites another or when two male rattlesnakes engage in "combat dances." Less dramatically, lizards will bob their heads to advertise their territory.

You'll always see reptiles soaking

up heat by lying motionless under heat lamps. In fact, this vital behavior is the one that has probably contributed the most to people thinking that these animals "don't do much."

Last (but not least!), you'll see keepers providing "life support"—food, shelter, medical care, proper temperatures, mating partners—for the interesting animals in our care.

Michael Davenport is keeper leader at the Reptile House.

The Keepers: Giving Life Support

Laurie Bingaman

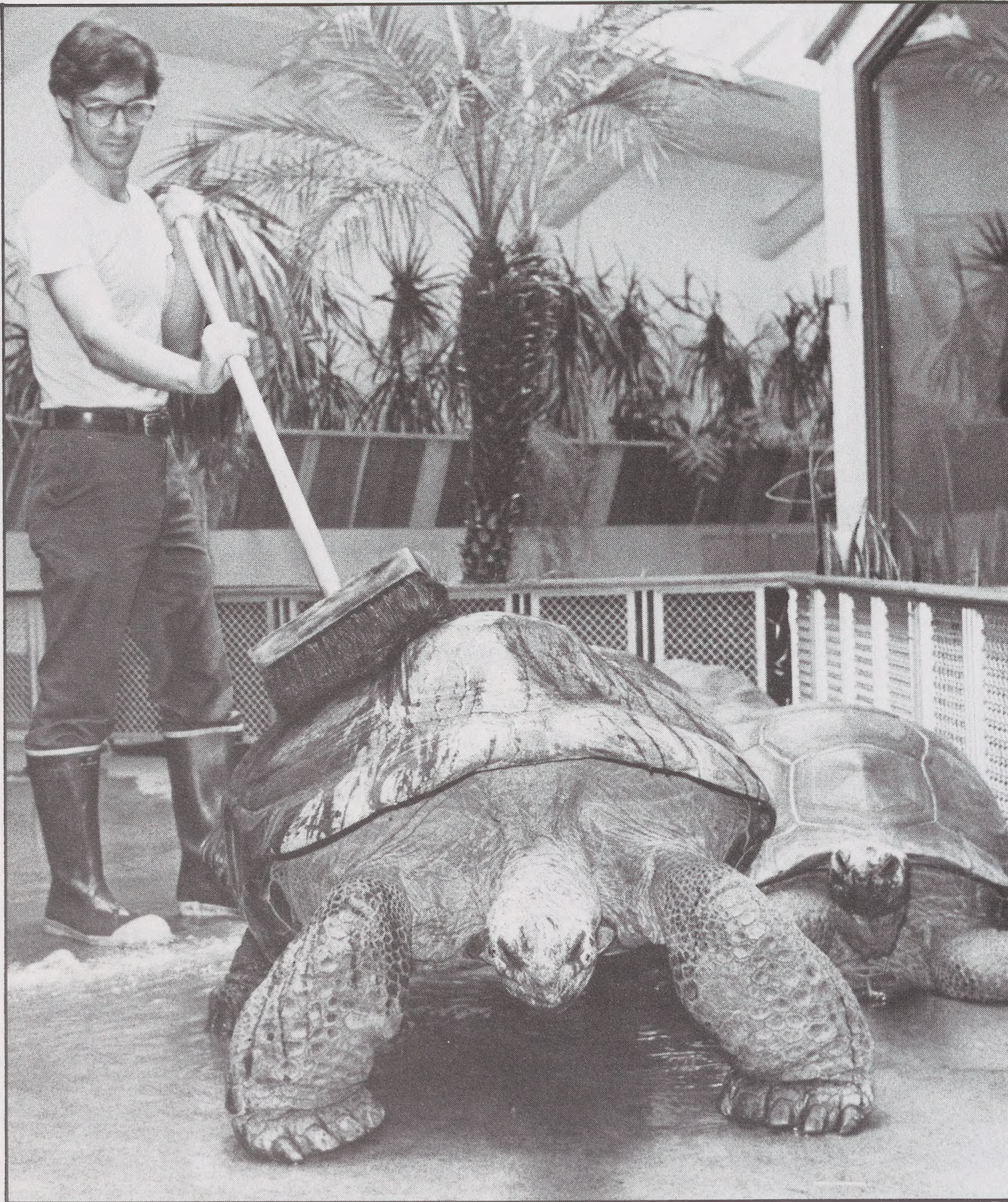
Many people believe zookeepers spend the whole day working directly with the animals. Keepers actually spend more time doing things to the animals' surroundings that affect their well-being.

Much of the morning is spent on cleaning enclosures. Uneaten food and waste are removed with long-handled scoops which are disinfected between enclosures. The larger snakes and lizards have pools that must be drained, scrubbed and refilled. Crocodile and large turtle tanks are cleaned only when necessary, since it takes several hours to fill each one.

Holding areas must be cleaned, too. These house newly-hatched herps, animals in breeding programs or with medical problems and newly-arrived animals in quarantine.

Plants in the enclosures are misted and watered, thinned, repotted and pruned as needed. Because commercial insect sprays could be harmful to the herptiles, a spray solution of one teaspoon Ivory liquid soap to 10 gallons of water is used to keep insects under control.

Finally, floors are swept and puddles squeegeed away, and the public area is checked and cleaned.



Part of the cleaning routine for the Aldabra tortoise enclosure is a shell-scrub. The keeper is David Kessler.

Jessie Cohen, NZP Office of Graphics and Exhibits

Throughout the morning, keepers check for any signs of illness in the animals and carefully monitor the temperature in each enclosure, a factor which is critical to the animals' survival and sometimes their breeding. Thermometers that register the high and low temperatures of the previous 24 hours are used.

The afternoons are spent working on special projects, the more complicated maintenance chores and the inevitable paper work, including daily and weekly reports on the animal collection. Keepers may also contact other herpetology experts to share information on husbandry.

Some of the animal enclosures may get face-lifts with a few new plants or rocks; others may be completely refurbished with new sealer and paint and fresh soil, gravel and plants.

Finally, keepers are always ready to respond to people asking for help—from the scientist requesting a copy of a paper written by the Zoo herpetological staff to a child needing a hand with science homework.

Laurie Bingaman is a member of the Zoo's herpetology staff.



Because amphibians, like this fire salamander, can absorb toxins through their skin, the Reptile House keepers drain and clean their tanks daily to keep them fresh.



Above: Weight loss is a clue that an animal might be ill. Keeper Bob Davis demonstrates the only way to get a snake safely on a scale—put it in a sack first. Other signs of possible illness are refusal to eat, labored breathing and changes in activity. Animals that may be sick are added to the veterinarian's daily rounds.

Below: The tokay gecko has rows of microscopic, hair-like "fingers" on the bottoms of its toes so it can grab onto the irregularities of any surface, including glass. When keepers need to get the gecko off the glass, they run water down the surface and the gecko loses its hold. Glass has to be cleaned on the public side of the enclosures as well as on the inside—the more popular the exhibit, the more fingerprints there are!



Jessie Cohen, NZP Office of Graphics and Exhibits

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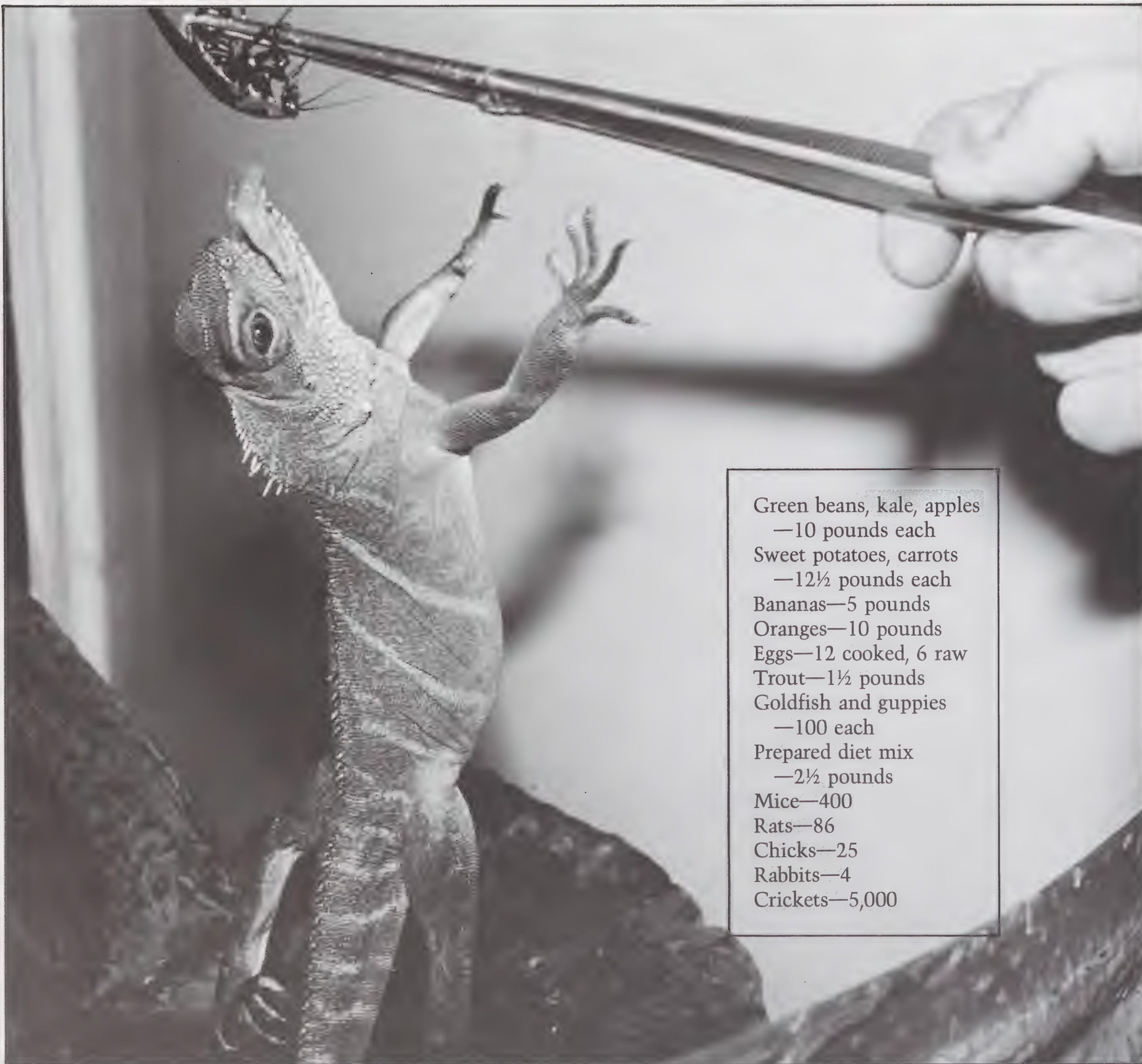


Left: A savannah monitor gets a nail clip from keeper Trooper Walsh. The animals' nails would be worn down in the wild, but they must be clipped in the Zoo to prevent them from curving under and interfering with walking.

Below: With venomous snakes like this South American rattler, the identification card on the keeper's side of the enclosure is color-coded to indicate a "hot" or venomous animal. The card gives the antidote for the particular snake's bite. Keepers handle these animals with hooks or tongs.



Milton H. Tierney, Jr.



Green beans, kale, apples
—10 pounds each
Sweet potatoes, carrots
—12½ pounds each
Bananas—5 pounds
Oranges—10 pounds
Eggs—12 cooked, 6 raw
Trout—1½ pounds
Goldfish and guppies
—100 each
Prepared diet mix
—2½ pounds
Mice—400
Rats—86
Chicks—25
Rabbits—4
Crickets—5,000

One of the Zoo's water dragons reaches for an insect meal.

Dining, Herptile-Style

Bob Davis

The “menu” at left isn’t exactly your average grocery list, but it is a typical food order for one week at the Reptile House.

Visitors often ask what time the reptiles will be fed and are surprised to learn that most eat only once or twice a week. Compared to mammals and birds, reptiles and amphibians require less food for a given amount of time.

The herptiles use less food energy because of their metabolism—see “Hot and Cold,” next page. Another reason is that they may take in hundreds of times their daily food requirement in one meal.

Although some snakes have lived two or more years without food, this is not a good feeding policy. The longer an animal fasts, the weaker it becomes, losing its resistance to stress, disease and parasites.

It is not unusual, however, for animals to go “off feed” at times, especially during the winter months or pregnancy. If an animal begins to lose weight and efforts to induce feeding have failed, force feeding can be done as a last resort. Food is either pushed into the throat with forceps and massaged down to the

stomach or a balanced liquid diet is sent down the throat with a syringe.

Zoo diets often differ from the animal’s natural diet. The Zoo’s king cobra, which is primarily a snake-eater in the wild, will accept dead mice and rats if they have been wrapped in the skin shed from another snake.

Waving food with forceps may induce feeding, but some animals need the movement of live prey to initiate feeding. For example, a green Anolis lizard will ignore a dead cricket, but when a live one walks by, the lizard quickly chases it down and eats it.

Most reptiles and amphibians are basically meat- or insect-eaters. Many that eat chiefly vegetation also eat some meat, especially as juveniles. Snakes are strictly carnivorous. Wednesday is the main feeding day at the Reptile House for carnivores, although some feeding goes on throughout the week.

On Mondays and Thursdays, a chopped salad is fed to some of the lizards, turtles and tortoises. The bulk of the vegetarian food is for the giant tortoises, fed biweekly. Less salad is required during warm months when these large reptiles are moved to outside enclosures to graze.

The insectivores, most amphibians and many of the smaller lizards, are normally fed twice a week on varying days. The crickets fed are sorted by size and given to appropriate-sized herps.

Vitamin and mineral supplements are mixed with the salad and also sprinkled over the crickets. Medication may be given with the food.

How do herptiles capture prey and feed? There are three methods snakes use to capture prey. Some grab and overpower prey with their mouths; others wrap the constricting coils of their bodies around prey. Injecting venom is the most highly evolved method. The snake “smells” by picking up particles with its delicate forked tongue and carrying them back to a sensory organ in its mouth. Some snakes have heat-sensitive pits that detect body heat.

Snakes have needle-sharp teeth, but the teeth curve backward to hold food and are useless for chewing. And the snake has no limbs for holding or tearing food. What it does have is moveable hinged bones in its skull and highly elastic skin, allowing it to open its mouth wide enough for prey larger than its head. The lower jaw is split in front and connected with an elas-

tic tissue that can stretch for even more room.

Lizards can also eat surprisingly large animals whole. The Zoo's Malayan water monitors can gulp down adult rats. Lizards use their legs to hold and tear prey, as turtles use their clawed feet. Turtles lack true teeth, but they have sharp-edged beaks and can cut and crush food with their jaws.

The Zoo's mata mata turtle uses camouflage to ambush prey in the wild; its head resembles its rocky, underwater surroundings. When the unknowing prey animal swims in front of it, the turtle distends its throat, pulling in both water and prey like an underwater vacuum cleaner.

The alligator snapping turtle sits motionless with its mouth open. The only movement comes from a small, wiggly, worm-like protrusion on the tip of its tongue. When a fish comes in to get this "bait," the jaws snap shut.

Alligators, crocodiles and caimans have developed a dramatic way of handling prey too large to swallow. They grasp it with powerful jaws and well-developed, pointed teeth and twirl themselves over and over, spinning the prey and tearing it apart. (The Zoo's nine species of crocodilians are fed bite-sized morsels that don't require the spinning treatment.)

The Zoo's amphibians, an assortment of frogs, toads and salamanders, eat crickets, mice, earthworms,

guppies, goldfish, maggots, chicks and prepared food mixtures. Many amphibians flick their tongues out to capture prey while others seize it with their mouths.

Amphibians can also eat surprisingly large prey. American bullfrogs eat chicks and adult mice. African bullfrogs and ornate horned frogs have prominent teeth that allow them to deliver an impressive bite.

The Zoo's reptiles and amphibians are a varied group, and meeting their food requirements is a big job for the herpetological staff. But it's all part of maintaining exhibits that will increase the public's appreciation of the animals.

Bob Davis is a keeper at the National Zoo's Reptile House.

Hot and Cold

Reptiles and amphibians are commonly called "cold-blooded," but a more accurate term is *poikilothermic*, just as *homeothermic* is more accurate than "warm-blooded."

Homeotherms, including humans, maintain their body temperatures internally, while poikilotherms approximate the temperatures of their surroundings. This means that herps use less energy and fewer calories because they don't have to generate heat internally.

Reptiles have developed a number of ways of using sunlight and warm spots in the environment to control their body tem-

peratures. Far from being "cold-blooded," herps can have body temperatures higher than ours.

Herps bask in the sun or lie on warm surfaces to heat up. In fact, lizards have been seen on the snowy slopes of the Andes Mountains in South America. They come out on the rocks to warm up and then scamper about briefly in the snow.

In warm climates, reptiles can cool down by going into a pond or rock crevice or an underground burrow.

Although poikilotherms and homeotherms have different methods of regulating their temperatures, they achieve the same end of surviving out in the cold (or hot!) world.

—B.D.

Revealing the Family Secrets of the Herptiles



The Zoo's emerald tree boas coil together to breed.

Trooper Walsh

Compared to what we know about the husbandry and breeding of most birds, mammals and fish, our knowledge about reptiles and amphibians is barely out of the Stone Age.

One reason is that herptiles lack the appeal of our feathery and furry friends, the birds and mammals. Many people find reptiles and amphibians hard to accept at all, much less relate to. Two decades ago, someone talking about the beauty of two boas mating in a forest canopy would have been branded as strange at best!

But today's herpetologists have "come out of the closet" with the desire to better understand these animals and share that knowledge with anyone willing to listen.

In the Zoo's Department of Herpetology, we must be selective about the animals we choose to breed so that we make the best use of our facility. We consider availability of animals, possibilities for genetic diversity, need for special diets and environments, availability of space and keeper time, and status of

Trooper Walsh

information already existing for a particular species. About one-third of the 100 species in the Zoo's reptile and amphibian collection are considered priorities for husbandry research.

Once a species is selected, we try to obtain as large a group of animals as we can. We prefer large groups of a few species to increase genetic diversity. We also cooperate with other zoos and institutions on breeding programs.

Until recently, the term "breeding project" was used loosely. It often applied in retrospect to an event that had just happened. If herptiles were maintained together and produced young, it was called a breeding project! For the most part, these "projects" came as a complete surprise, and no one could say exactly what encouraged the animals to breed in the first place. Sometimes they bred once and that was it!

A true breeding project or behavioral study must be carefully planned. Keepers must be familiar with the special needs of the animals and their native environments.

Our goal is to determine what stimulus triggers what behavior. We change stimuli such as photo period (length of night and day), daily and seasonal temperatures, rainfall and humidity, and then we observe the results. Once the important stimuli are isolated and the desired behavior is obtained, the process must be repeated over and over and the data recorded consistently to verify



Keeper Bela Demeter makes careful records on young water dragons.

the conclusions.

Compiled data are used to help future generations of our own animals and to publish papers to share our information.

Two herptiles we are presently working with are the emerald tree boa and the ornate horned frog, both native to South America.

The emerald tree boa is a rare, highly specialized snake from the rain forests of the Amazon Basin. Emeralds are medium-sized constrictors (up to two meters), adapted for nocturnal, arboreal living. They have a prehensile tail, green coloration for camouflage and heat sensors for detecting prey. The young, born live, are commonly brick red and by adulthood have changed to bright green.

The National Zoo has quite a large group of emerald tree boas. Until recently, these animals were hard to keep alive, much less breed. But our research and experience has given us a better understanding of this snake. Since 1977, we have had three successful breedings.

In the tropics where emeralds are found, the annual rainy season brings sudden temperature changes. We attempted to duplicate the climate conditions that we felt might stimulate reproduction.

We provided a twelve-hour light cycle for our emeralds. For nine months between January and September, breeder animals were exposed to daily temperature changes ranging from 70 to 85

degrees F. Daily cage spraying produced peaks in humidity that coincided with the daily maximum temperature.

From October through December, daytime temperatures remained about the same, but the nighttime temperatures dropped to around 60 degrees F. During this period and shortly after, courtship and breeding occurred. Young were born eight months later (emeralds can have litters of up to fourteen).

Until recently. . .if herptiles were maintained together and produced young, it was called a breeding project!

One experiment showed us that gravid (pregnant) females have different temperature preferences from non-gravid females and males. We also learned that a gravid female's thermal needs may change at different stages of pregnancy.

If we know little about breeding reptiles, we know even less about breeding amphibians. Our fire-bellied toad "breeding project" began one day when the heat failed in their exhibit area. Calling and amplexing* resulted, and soon we had eggs, tadpoles and young toads everywhere.

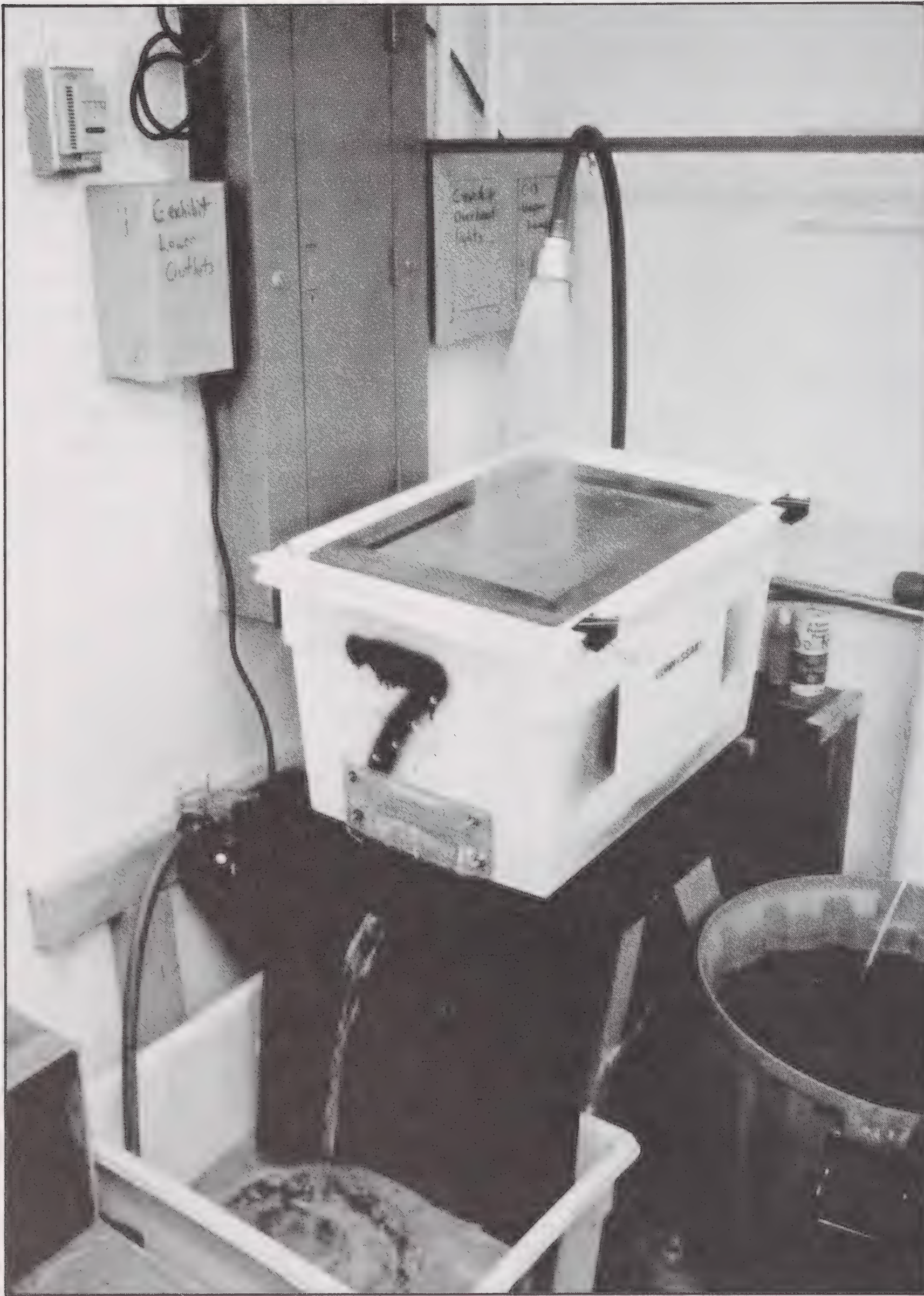
**The male clasps the female and fertilizes her eggs as they emerge.*

For years, scientists have bred certain amphibians by injecting hormones which stimulated reproductive activity. Although we have considered this method of breeding some of our rare amphibians, we decided we would try natural stimuli first.

The ornate horned frog, a six-inch amphibian with the personality of a 50-foot dragon, was chosen as a trial species. Unlike most frogs, it has damaging teeth and powerful jaws for subduing prey. Prey includes anything that moves and fits into the mouth! Bright greens, reds, blues and yellows swirl over the ornate horned frog's body.

The horned frog is terrestrial and specially adapted to endure harsh climates. During dry spells, it burrows underground, and its skin hardens into a cocoon, sealing in body fluids. It may lie dormant for months. When heavy rains come, the skin softens and the frog is "reactivated." Feeding and breathing are its foremost thoughts at this time.

Because heavy rains are thought to induce horned frog breeding in nature, we decided to provide our horned frogs with heavy rain right in the Zoo. Our rain box consists of two plastic tubs, a recirculating pump, a garden hose and a shower head. Water pours into one tub, overflows into the second and is recirculated into the first. De-chlorinated water is used because chlorine is known to have adverse



effects on egg and tadpole development.

The pair of frogs first used in the experiment had been in captivity for several years without breeding activity. Within an hour of being placed in the box, the male began calling loudly and persistently. By the end of the day, he had the female in amplexis! We found hundreds of eggs in the rain box the next morning.

Unfortunately, only one egg developed into a tadpole, and this tadpole lived only two days. The reason for such high infertility was not readily apparent. But more breeding trials are soon to come, and we hope to answer many questions.

It's all in a day's work for the Zoo's herpetology department. Slowly but surely, some of the mysteries of herptile husbandry and breeding are being unraveled.

Trooper Walsh is a keeper at the National Zoo's Reptile House.

Trooper Walsh

The ornate horned frogs began breeding when they were provided with this home-made rain forest.

Do Herptiles Make Good Parents?

Most don't, but some do. Parental care has been documented in some frogs, snakes and crocodilians (which include alligators, crocodiles, caimans and gavials).

For example, some species of arrow poison frog have structured societies and parental care. In the rainy season, the males congregate in chirping masses that attract females.

The females fight to establish dominance, and those individuals pair off with the patient males. The eggs are laid in "cups" of fallen leaves filled with rain water. When the tadpoles emerge, the female carries them on her back to an arboreal nursery, perhaps a tree hollow with water in it. The mother submerges herself and the tads detach. They're on their own then and remain in the nursery several weeks until they metamorphose into small frogs.

In crocodilians, large adult males of some species will stake out a territory. During the breeding season, one or more females enter a male's territory to breed—all others are chased away.

Each breeding female then stakes out her own territory which she defends against all others except possibly the father. She collects mud, grass and debris into a mound above water level and deposits her eggs in it. Persistent intruders, from

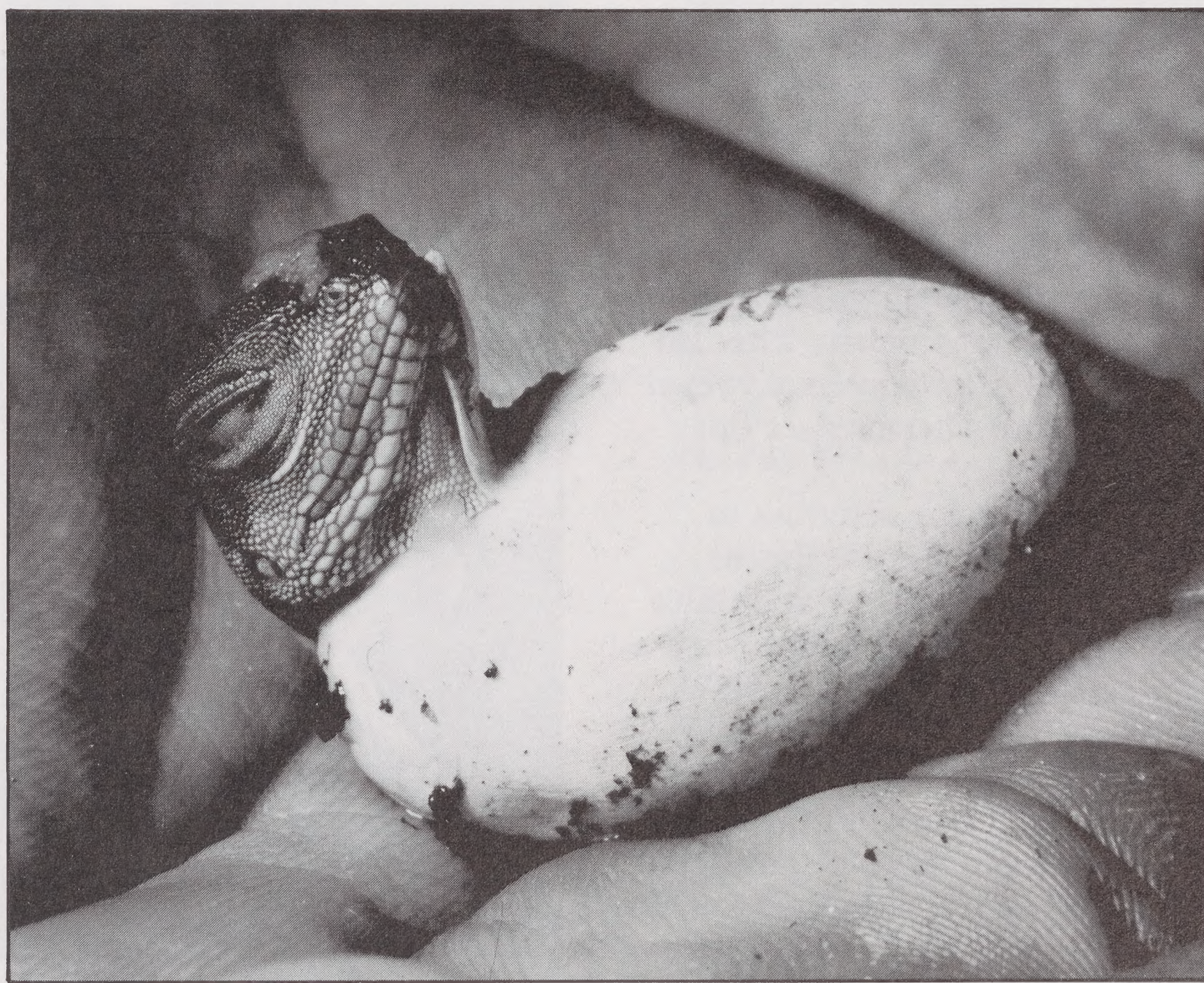
hungry raccoons to curious people, may be charged and attacked by either the male or female.

When the young are ready to hatch in 60 to 90 days, they make muffled grunting noises. The mother (or sometimes the father) will uncover the mound, gently break open the eggs with its teeth and take the babies into its mouth. The young are then carried in their toothy crib to the water's edge where they are released. They stay in the shallows for a time under the protection of their parents.

Among snakes, pythons exhibit a form of parental care by regulating the temperatures of their egg nests, or clutches. The ball python basks in the sun and then envelops her clutch with her body. The Burmese python uses muscular contractions to maintain clutch temperatures and can generate heat up to 10 degrees F above ambient temperatures.

These are some of the things zoologists have learned about herpetile behavior in just the last decade.

—T.W.



A brand new water dragon makes its way into the world.

Jessie Cohen, NZP Office of Graphics and Exhibits

HERPlab: Family Learning Center

Judy White

"I learned the difference between reptiles and amphibians. I've been mixed up about that since I was a kid."

"This lessens people's fears of reptiles."

"It gets you thinking and looking."

"It's a wonderful learning place."

These are just a few of the hundreds of enthusiastic comments visitors have made after they've visited HERPlab, the newest education exhibit at the National Zoo.

HERPlab is a zoology classroom for families, tucked away in the middle of the Reptile House. "Herp" is short for herpetology, the study of reptiles and amphibians. The "lab" refers to the kind of interactive environment that characterizes this special place.

There are many activities to choose from, objects to touch, games, puzzles, quizzes and films. Each day an African bullfrog and a corn snake are put on exhibit in specially designed plastic boxes with mirrors in the bottom for better viewing. Accompanying cards point out features to observe and supply answers to questions people usually ask.

The live animal activities are very popular, but so are the activity



One of the activities at HERPlab is "Turtle Bones," with a real skeleton for visitors to put together. The assembly guide also tells about the functions of the various bones.

Jessie Cohen, NZP Office of Graphics and Exhibits

boxes. "Turtle Bones" is a kind of puzzle box with real bones for the visitor to assemble on a plexiglas board. An assembly guide tells about the bones and their functions for those who want to know more.

The "Territory" activity has a board game painted to resemble the woodland home of *Anolis* lizards. Each player takes the role of a lizard: one is a resident defending its territory, the other an intruder. Some visitors really get into the spirit of the game, bobbing their heads like lizards or extending imaginary throat fans.

From visitor comments, it seems that it is the *range* of activities that appeals to people. Families (adults with children six to twelve years old) are our most frequent visitors, and each member gets involved. Some stay more than an hour.

In an area called "Reptile Keepers," visitors can look through glass doors to see the keepers in their work area behind the exhibits. The location of HERPlab in the middle of the building and the fact that it is closely integrated with the day-to-day work of the herpetology department make this lab different from our other two popular learning centers, ZOOLab and BIRDLab.

Thanks to a grant from the National Science Foundation, which funded staff, consultants and materials, HERPlab was planned in a careful step-by-step way, building on our experience with BIRDLab and ZOOLab. Ideas were incorporated

from herpetologists (including our collaborators, the National Zoo herpetology staff), zoologists, educators and families who tried out prototype materials.

The activities are based on aspects such as anatomy, behavior and communication which apply to all animals. Materials have been developed with different levels of information to serve those who want to know some, a little or a lot, and to interest family members of all ages and stages of experience.

HERPlab materials will continue to be fine-tuned based on evaluations of their use, including interviews with visitors. The materials are also being tested at the John Ball Zoo in Grand Rapids, Michigan, and the Philadelphia Zoo. Education specialists and other staff members there are working closely with us, observing how the materials are being used and interviewing visitors for their reactions. The results will help improve the materials so they can best serve visitors at the National Zoo and other places as well.

In time, zoos across the country will make use of the concepts pioneered here.

Judy White is Chief, Office of Education, National Zoological Park.

For HERPlab hours and other information, contact the Zoo Office of Education at 673-4724.

SOME GOOD BOOKS ON REPTILES AND AMPHIBIANS

Mostly for young people

Brenner, Barbara. *A Snake-Lover's Diary*. Reading, MA: Addison-Wesley, 1970.

Cole, Joanna. *A Frog's Body*. New York: William Morrow, 1980.

Cole, Joanna. *A Snake's Body*. New York: William Morrow, 1981.

Freschet, Bernice. *Lizard Lying in the Sun*. New York: Charles Scribner's Sons, 1975.

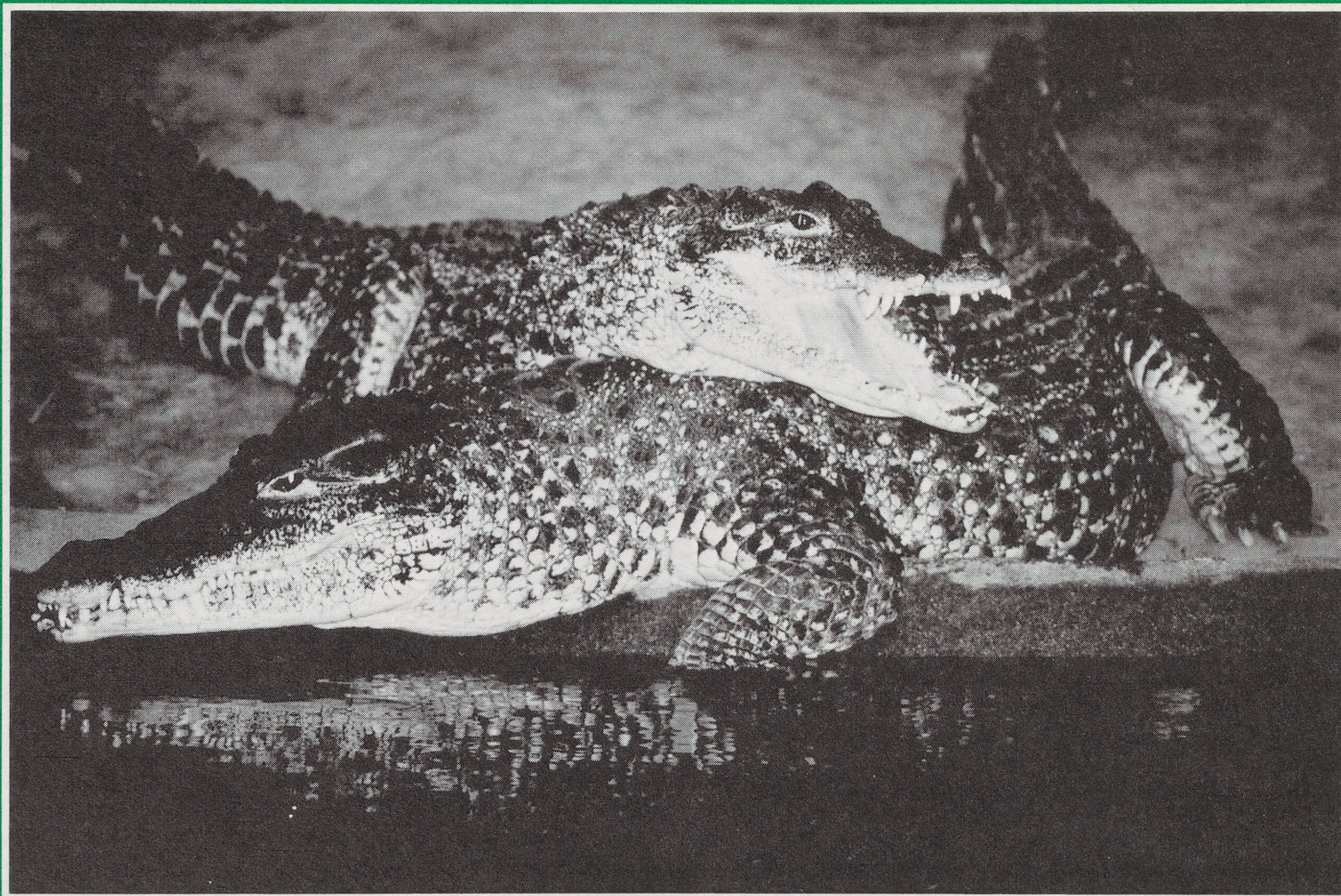
Roever, J. M. *Snake Secrets*. New York: Walker & Co., 1979.

Mostly for adults

Carr, Archie. *The Reptiles*. New York: Time-Life Books, 1963.

Cochran, Doris. *Living Amphibians of the World*. Garden City, NY: Doubleday & Co., 1961.

Conant, Roger. *A Field Guide to Reptiles and Amphibians of Eastern and Central North America*. Boston: Houghton-Mifflin Co., 1975.



Jessie Cohen, NZP Office of Graphics and Exhibits

The Zoo's Cuban crocodiles are native to coastal swamps and fresh water areas of Cuba. The Reptile House keepers have had some success in getting the crocs to respond to sound cues. When you come to this exhibit, look carefully at the plantings, also native to Cuba, and you'll see small lizards sharing the crocodiles' home.

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